WHAT IS CLAIMED IS:

1. An optical pulse waveform converter, comprising:

a coupled plurality of optical elements comprising:

an optical pulse input port configured to receive an input optical pulse;

a nonlinear optical element configured to broaden a wavelength content of an optical pulse routed through said nonlinear optical element;

a dispersive optical element configured to modify a temporal profile of an optical pulse routed through said dispersive optical element;

a wavelength selecting optical element configured to pass selected wavelength components of an optical pulse routed through said wavelength selecting optical element; and

an optical pulse output port configured to output an optical pulse comprising different optical characteristics than said input optical pulse.

2. The waveform converter of Claim 1, wherein said nonlinear element and said dispersion element comprise a plurality of optical fibers having different nonlinear coefficients and a plurality of optical fibers having different dispersion characteristics.

3. The waveform converter of Claim 2, wherein said optical fibers having different nonlinear coefficients are alternately disposed with said optical fibers having different dispersion characteristics.

4. The waveform converter of Claim 2, wherein said optical fibers differ in length.

5. The waveform converter of Claim 1, wherein said nonlinear element comprises a highly nonlinear optical fiber having a nonlinear coefficient of $5.0\ W^{-1}km^{-1}$ or larger.

6. The waveform converter of Claim 1, further comprising at least one optical amplifier.

7. The waveform converter of Claim 1, wherein said dispersive optical element and said wavelength selecting optical element are combined in a single optical medium.

8. The waveform converter of Claim 7, wherein said single optical medium comprises a chirped fiber Bragg grating.

9. The waveform converter of Claim 1, wherein said coupled optical elements are coupled in the order of input port, nonlinear optical element, dispersive optical element, wavelength selecting optical element, output port.

10. The waveform converter of Claim 1, wherein said coupled optical elements are coupled in the order of input port, dispersive optical element, nonlinear optical element, wavelength selecting optical element, output port.

11. The waveform converter of Claim 1, wherein said wavelength selecting element comprises a fiber grating.

12. The waveform converter of Claim 1, wherein said wavelength selecting element comprises a bandpass filter.

13. A device for modifying an optical signal having a pulse waveform, said device comprising an element for exerting a nonlinear effect on said pulse waveform, an element for exerting a dispersion effect on said pulse waveform, and an element for changing an optical spectrum profile of said pulse waveform.

14. An optical pulse waveform converter, comprising:

a plurality of nonlinear elements for exerting a nonlinear effect on an optical pulse;

a plurality of chirped fiber grating elements for exerting a dispersion effect on said optical pulse and for modifying an optical spectrum profile of an optical pulse.

15. The optical pulse waveform converter of Claim 14, further comprising a first optical circulator coupled to a first of said nonlinear elements, a first of said chirped fiber gratings, and a second of said nonlinear elements, and a second optical circulator coupled to said second nonlinear element, and a second of said chirped fiber gratings.

16. An optical pulse waveform converter, comprising:

a plurality of nonlinear elements and a plurality of dispersion elements coupled in an alternating series;

a wavelength selecting element coupled to an output of said alternating series.

17. The optical pulse waveform converter of Claim 16, wherein said alternating series of nonlinear elements and dispersion elements comprise coupled optical fiber segments.

18. The optical pulse waveform converter of Claim 17, wherein said optical fiber segments become progressively shorter from an input end to an output end of said alternating series.

19. A method for converting an optical pulse waveform, said method comprising:

broadening the wavelength content and narrowing the temporal width of an input optical pulse to produce a modified optical pulse; and

selecting a portion of the wavelength content of said modified optical pulse to produce an output optical pulse.

20. The method of Claim 19, wherein said broadening is performed prior to said narrowing.

21. The method of Claim 19, wherein said narrowing is performed prior to said broadening.

22. The method of Claim 19, wherein said broadening is performed by routing said input optical pulse through a nonlinear optical medium.

23. The method of Claim 19, wherein said narrowing is performed by routing said input optical pulse through a dispersive optical medium.

24. An optical pulse light source, comprising:

a modulated signal light source having output pulses characterized by a temporal waveform and a wavelength content;

a waveform converter coupled to receive said output pulses from said signal light source and comprising a nonlinear optical element, a dispersive optical element, and a wavelength selecting optical element, wherein said waveform converter is configured to output optical pulses which have different wavelength content than said optical pulses output from said signal light source.

25. The light source of Claim 24, wherein said output optical pulses from said waveform converter have a center wavelength closer to 1550 nm than the center wavelength of said modulated signal light source output pulses.

26. A device for producing a optical pulses for optical amplification and communication, said device comprising:

a laser producing a modulated producing a modulated light signal output;

a waveform converter having said light signal output as an input, said waveform converter comprising:

a nonlinear optical element configured to broaden a wavelength content of an optical pulse routed through said nonlinear optical element;

a dispersive optical element configured to modify a temporal profile of an optical pulse routed through said dispersive optical element;

a wavelength selecting optical element configured to pass selected wavelength components of an optical pulse routed through said wavelength selecting optical element.

27. A method of changing the wavelength content of a first optical pulse, wherein said first optical pulse has an optical spectrum centered at a first wavelength, said method comprising spreading the optical spectrum of said first optical pulse to produce a spread optical spectrum, selecting a second wavelength from said spread optical spectrum, and filtering wavelengths outside of a selected wavelength band around said second wavelength band so as to produce a second optical pulse having an optical spectrum centered approximately at said second wavelength.